Malalignment Syndrome in Runners

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KEYWORDS

• Pelvic malalignment • Malalignment syndrome • Back • Groin and limb pain
• Asymmetrical forces • Problems in runners • Manual therapy

KEY POINTS

- Understanding malalignment is essential for those caring for runners; approximately 80% have pelvic malalignment, which can mimic, hide, overlap with, trigger or aggravate other medical conditions.
- Malalignment syndrome includes the biomechanical changes, abnormal stresses, and resulting signs/symptoms seen with an upslip and rotational malalignment.
- A standard back examination can be misleading because it fails to assess alignment and does not look at the sites typically affected by pelvic malalignment.
- Malalignment can be corrected by following a supervised course of treatment that combines realignment, core strengthening, reestablishing movement patterns, and the timely use of appropriate complementary techniques.
- Treatment includes instruction in self-assessment and self-treatment to allow the runner to achieve and maintain realignment on a day-to-day basis and increase the chances of a full recovery and achieving his or her full potential.

INTRODUCTION

Running is an asymmetric sport in that it requires bearing weight alternately on the right and left lower extremities and absorbing the resulting unilateral forces as best as possible as these are transmitted upward through the knee, hip, pelvis, and lumbosacral region to the spine.[1] Malalignment refers to a minimal displacement from the normal alignment of any of the bones that are part of this kinetic chain and that results in abnormal biomechanical stresses that can compromise the ability to deal with these forces. This discussion focuses on the 3 most common presentations of pelvic

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malalignment. The term 'malalignment syndrome' refers to the biomechanical changes, signs and symptoms consistently seen in association with 2 of these presentations. Recognition of malalignment and the resulting detrimental effects should be part of the routine examination carried out by those caring for runners to avoid misdiagnosis, mistreatment, delayed recovery, and possibly failure of the runner to realize his or her full potential.

THE PELVIC RING: NORMAL AND ABNORMAL MOBILITY AND FUNCTION

The sacroiliac (SI) joint is an intricate joint that depends on its configuration and its supporting ligaments (**Figs. 1** and **2**), individual muscles (**Fig. 3**), and a system of inner and outer core muscles and myofascial slings to:

1. Allow for the smooth transfer of weight upward or downward through the lumbo–pelvic–hip complex[2] (**Fig. 4**);
2. Help ensure stability of the joint when this is functionally required; for example, on the weight-bearing side during walking and running[3–7]; and
3. Permit a minimal (2-4 mm at most) of SI joint motion: rotation around all 3 axes and movement (translation) along the corresponding planes (**Fig. 5**).[8–10]

This motion is essential for mobility and helps to absorb stress and store energy while decreasing the energy cost of running. During the gait cycle, for example, there is rotation of the pelvis as a whole, of the sacrum around one of the diagonal axes (**Fig. 6**), and of each innominate relative to the sacrum[5,9]:

a. In the coronal (or frontal) plane: upward on the weight-bearing side (see **Fig. 4**B);
b. In the sagittal plane: rotation forward (or anterior) during stance-phase, backward (or posterior) on swing-through (see **Fig. 6**); and
c. In the horizontal (or transverse) plane: outward (or outflaring) during stance phase, inward (or inflaring) with swing-through (**Fig. 7**).

Excessive rotation of an innominate relative to the sacrum around any of the 3 main axes can result in the innominate on one or both sides literally getting "stuck" in the direction of 1 or more of these 3 planes (see **Fig. 5**). Susceptibility to this occurring is attributable in part to the intricate configuration of the SI joint (**Fig. 8**):

1. It is L-shaped, with the 2 main arms of the sacral articular surface being oriented along different planes;
2. The upper and lower sacral surfaces are intimately molded to those on the innominate by way of:
   a. The concavity of 1 surface being matched by a corresponding convexity of the opposing surface[11,12];
   b. The gradual development of a crescent-shaped ridge running the length of the iliac surface, with a matching depression on the sacral side[13–15]; and
   c. Anterior widening of the sacrum, which restricts movement between the innominates by causing wedging in an anterior-to-posterior direction.

These features enhance the stability of the joint, especially on weight bearing, and also allow for some movement of 2 to 4 mm between the joint surfaces. Abnormal loading conditions that exceed this normal displacement in any direction can cause the adjoining SI joint surfaces to end up in an aberrant position so that the surfaces no longer match and stay compressed in some areas, separated in others, affecting normal movement (see **Fig. 7**iii; **Figs. 9** and **10**).[16] If the surfaces do become fixed